

Work Order ID 57539

Split - 1 SF 10/04/19



Page 1

April 8, 2010 8:54:28 AM

Item ID: D3282-041

Accept



Setup Start



Revision ID:

Item Name: Float Web (206L/407)

1.0

Stop



Start Date: 4/08/10

Start Qty: 10.00



Cust Item ID:

Required Date: 4/16/10

Req'd Qty: 10.00



Customer:

Reference:

Approvals:

Process Plan:

CX

Date: 10/4/08

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Draw
Number

Draw
Rev.

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

Draw Nbr

Revision Nbr

D3282

Rev C

100

0.00



Skidtubes

Skidtubes

Memo

0.00

Skidtubes

1-Cut to length as per Dwg D3282.
per QSI0018

2- inspect for surface damage as

10/4/15

110

0.00



HAAS CNC VERTICAL MACHINING #1

HAAS 1

Memo

0.00

HAAS CNC vertical machine #1

1-Machine as per Folio FA579 & Dwg D3282 12-Deburr

10/04/17

10/5

120

0.00



QC2- Inspect parts off machine FAI/FAIB

QC

Memo

0.00

Quality Control

10/04/17

10/5

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D3282-041 PAR #: N/A Fault Category: Machined Parts NCR: Yes No DQA: 10 Date: 10.05.03
 Resolution: Acceptable Disposition: Use as is QA: N/C Closed: 10 Date: 10/05/03

NCR: <u>57539-1</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
10/04/17	110	One web has offset lift when machining on the last operation causing by removing the step of .050" by 20.00 long.	10/04/20 per Q51042	The 0.050" step removed from one side from front saddle to front. Acceptable. Margins still positive. See attached	10/04/17	10/04/20	10.04.20 per Q51042	10/04/27

NOTE: Date & initial all entries

April 8, 2010 8:54:28 AM



Accept



Setup Start



Stop



Start Date: 4/08/10 **Start Qty:** 10.00



Cust Item ID:

Required Date: 4/16/10 Req'd Qty: 10.00



Customer:

Reference:

Run Start

**Approvals:**

Process Plan:

Date:

Tooling:

Date:

Stop






QC:

Date:

SPC (Y/N):

Date:

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130 	QC8- Inspect parts - second check	0.00							
QC Quality Control	Memo	0.00				1	0		
140 	Chemical Conversion Coat per QSI005 4.1	0.00							
HandFinish Hand Finishing	Memo	0.00				1	-		AWM 10/24/20
150 	QC3- Inspect Part Finish	0.00							
QC Quality Control	Memo	0.00				1	1		10/24/22

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 57539

April 8, 2010 8:54:29 AM



Page 3

Item ID: D3282-041

Accept



Setup Start



Revision ID:

Stop



Item Name: Float Web (206L/407)

Start Date: 4/08/10

Start Qty: 10.00



Cust Item ID:

Required Date: 4/16/10

Req'd Qty: 10.00



Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Draw
Number

Draw
Rev.

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

160

0.00



Skidtubes

Skidtubes

Memo

0.00

Skidtubes

1-Install doublers as per Dwg D3282. Apply LPS-3 between doublers and web □ A/RN/ALPS-3 4104922

4104/22

170

0.00



QC5- Inspect part completeness to step on W/O

QC

Memo

0.00

Quality Control

5104/27



180

0.00



Identify as per dwg & Stock Location: 46

Packaging

Memo

0.00

Packaging

4104/22

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 57539

April 8, 2010 8:54:29 AM



Page 4

Item ID: D3282-041

Accept



Setup Start



Revision ID:

Stop



Item Name: Float Web (206L/407)

Start Date: 4/08/10 Start Qty: 10.00



Cust Item ID:

Required Date: 4/16/10 Req'd Qty: 10.00



Customer:

Reference:

Run Start



Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop



QC:

Date:

SPC (Y/N):

Date:

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Draw
Number

Draw
Rev.

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

190

QC21- Final Inspection - Work Order Release

0.00



QC

Memo

0.00

Quality Control

10/04/28 JF

PL 10-4-27
①

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

April 8, 2010 8:54:27 AM

Page 1

Work Order ID: 57539

Parent Item: D3282-041

Parent Item Name: Float Web (206L/407)


Comments: IPP Rev:B 05.09.23 Procedure change KJ/JLM

Start Date: 4/08/10

Required Date: 4/16/10

Start Qty: 10.00

Required Qty: 10.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
D2792-130 		Manufactured	No			160	Each	28.0000	10.0000			

EXTRUSION

Warehouse Loc Qty Loc Code

Location

Main Warehouse

MAT06

28

42366

28

D3283-1

Manufactured

No

160

Each

17.0000

20.0000



Doubler

Warehouse Loc Qty Loc Code

Location

Main Warehouse

ST048

17

52904

17

MS20470AD4-7

Purchased

No

100

Each

2,530.000

570.0000



Rivet, Universal Head

Warehouse Loc Qty Loc Code

Location

Main Warehouse

ST320

2530

112492

2530

10 M10/4/15

B57725 ② M10/4/22

57 M10/4/22

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

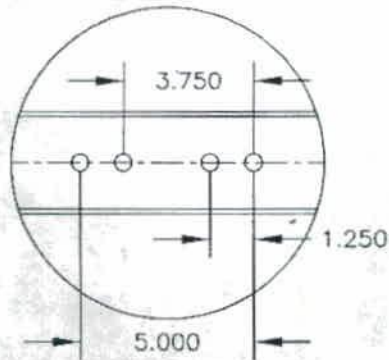
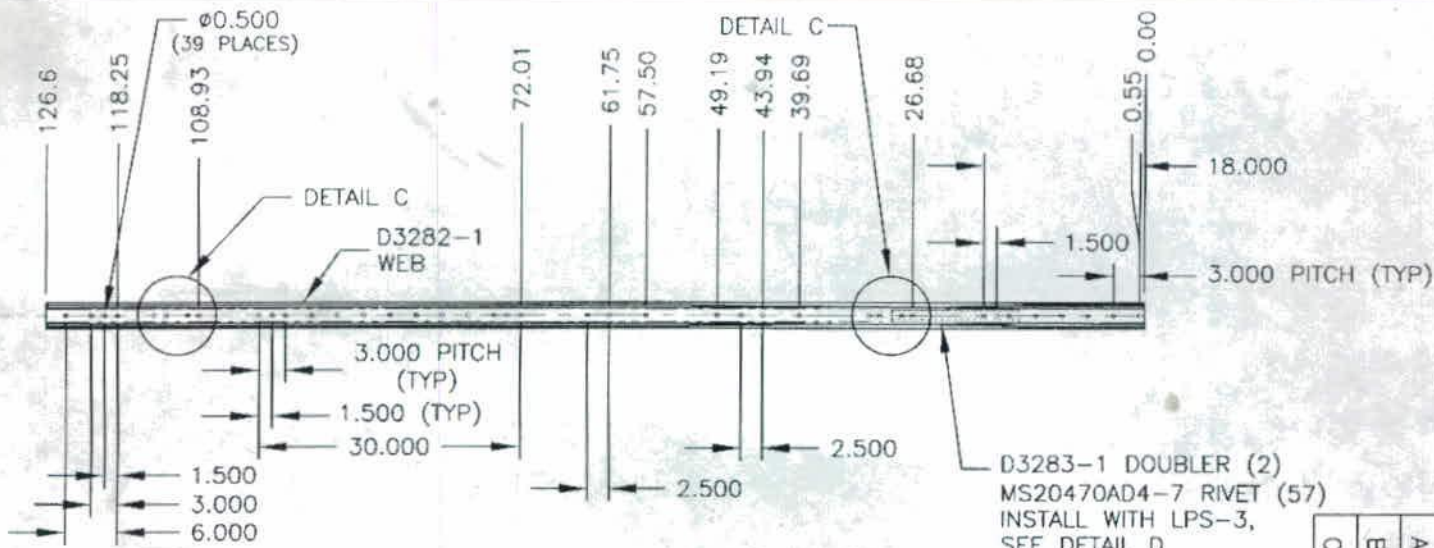
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

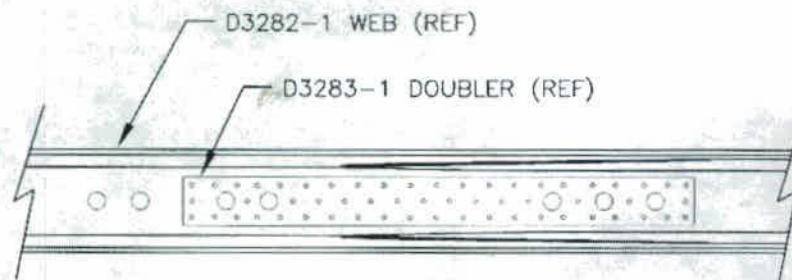
NOTE: Date & initial all entries

DART

DESIGN	CP	DRAWN BY	CP	DART AEROSPACE USA, INC.	
				PORT HADLOCK, WA	
CHECKED	#	APPROVED	#	DRAWING NO.	REV. C
			D3282	SHEET 1 OF 2	
DATE				TITLE	SCALE
05.08.09				FLOAT WEB, 206L/407	1:20
A				NEW ISSUE	
B				MOVE HOLES, ADD D3390-1 DOUBLERS	
C				REMOVE D3390-1, NOW MACHINED	



DETAIL C
SCALE 1:5
RIVET HOLES NOT SHOWN
FOR CLARITY



DETAIL D
SCALE 1:5

W/O 57539

RELEASED
05-01-12 H

D3282-041 FLOAT WEB

- 1) MAKE FROM D2792-130 EXTRUSION
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 4) BREAK ALL SHARP EDGES 0.010 TO 0.020
- 5) APPLY A LAYER OF LPS LABORATORIES' LPS-3 BETWEEN D3283-1 DOUBLERS AND D3282-1 WEB. INSTALL RIVETS COATED WITH LPS-3
- 6) SEE PAGE 2 FOR MACHINING DETAILS

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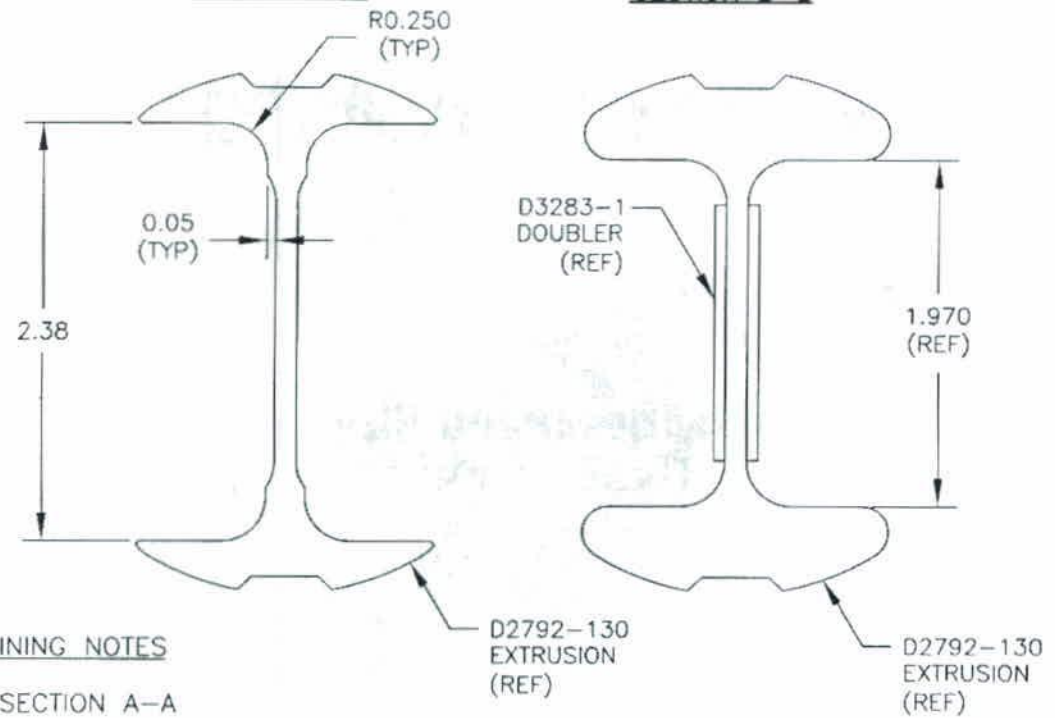
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DART

DESIGN	CP	DRAWN BY	CP	DART AEROSPACE USA, INC.
CHECKED	<i>[Signature]</i>	APPROVED	<i>[Signature]</i>	PORT HADLOCK, WA
DATE	05.08.09	TITLE	D3282	REV. C
			SCALE	1:20
				SHEET 2 OF 2
				FLOAT WEB, 206L/407

SECTION A-A

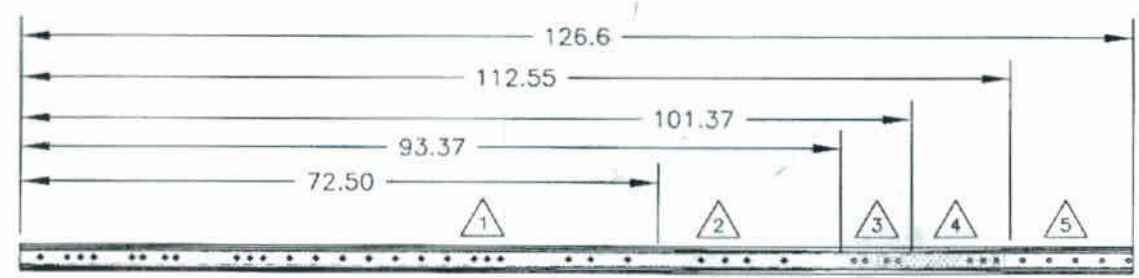
SECTION B-B



D3282-1 MACHINING NOTES

- 1 UNIFORM SECTION A-A
- 2 UNIFORM TAPER FROM SECTION A-A TO SECTION B-B
- 3 UNIFORM SECTION B-B
- 4 UNIFORM TAPER FROM SECTION B-B TO SECTION A-A
- 4 DRILL #30 (Ø0.128 REF) HOLES (57 PLACES) TO LINE UP WITH D3283-1. SEE DETAIL D FOR REFERENCE
- 5 UNIFORM SECTION A-A
- 6 R1.00 BETWEEN SECTIONS

w/o 57539



RELEASED
05.08.2009

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DART AEROSPACE LTD		Work Order: 57539
Description: Float Web		Part Number: D3282-041
Inspection Dwg: D3282	Rev: C	Page 1 of 1

FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
126.6	+/-0.100	126.625	✓			
1.500	+/-0.010	1.500	✓			
3.000	+/-0.010	3.000	✓			
6.000	+/-0.010	6.00	✓			
1.250	+/-0.010	1.250	✓			
30.000	+/-0.010	30.00	✓			
1.500	+/-0.010	1.50 72.01	✓			
72.01	+/-0.030	72.01	✓			
61.75	+/-0.030	61.62	✓			
57.50	+/-0.030	57.50	✓			
49.19	+/-0.030	49.19	✓			
43.94	+/-0.030	43.94	✓			
39.69	+/-0.030	39.69	✓			
26.68	+/-0.030	26.68	✓			
0.55	+/-0.030	.550	✓			
1.970	+/-0.010	1.970	✓			
2.38	+/-0.030	2.38	✓			
0.05	+/-0.030	.05	✓			

Measured by: SP	Audited by: MVE	Prototype Approval:	N/A	
Date: 10/04/17	Date: 10/04/20	Date:	N/A	
Rev	Date	Change	Revised by	Approved
A	07.04.02	New Issue	KJ/JLM	

1.0 Introduction

The purpose of this analysis is to substantiate the design of the Dart D206-642-511/-512/-513/-514 Float Skidtubes for the Bell 206L/407 aircraft. The Dart D206-642-511/-512 Float Skidtube installations will be compatible with Apical 614.5501/2 (fwd), 614.5701/2 (mid), and 614.5607/8 (aft) Tri-Bag Emergency Floats that are FAA STC'd per SR01535LA. The Dart D206-642-513/-514 Float Skidtube installations will be compatible with Apical Tri-Bag Emergency floats and Bell OEM float systems.

The D206-642-511/-512 Skidtubes will replace the 206-053-184-113/-114/-117/-118/-121/-122 float skidtubes but will not be compatible with OEM floats. The D206-642-513/-514 Skidtubes will replace the 206-053-184-113/-114/-117/-118/-121/-122 float skidtubes and will be compatible with OEM and Apical floats.

2.0 Material Properties

2.1 Material Properties Dart Skidtubes (6061-T6 QQ-A-200/8)

(Refer to drawing D2600 & D2792. Material properties are listed in Reference 1 Page 7A)

$E = 10000000 \cdot \text{lb} \cdot \text{in}^{-2}$	Young's Modulus for Aluminum	
$Ftu1 = 40000 \cdot \text{lb} \cdot \text{in}^{-2}$	Tension (ultimate)	$Fsu1 = 26000 \cdot \text{lb} \cdot \text{in}^{-2}$ Shear (ultimate)
$Fcy1 = 34000 \cdot \text{lb} \cdot \text{in}^{-2}$	Compression (yield)	$Fbru1 = 82000 \cdot \text{lb} \cdot \text{in}^{-2}$ Bearing (ultimate)
$Fty1 = 35000 \cdot \text{lb} \cdot \text{in}^{-2}$	Tension (yield)	$Fbry1 = 60000 \cdot \text{lb} \cdot \text{in}^{-2}$ Bearing (yield)
$\mu = 0.33$	Poisson's ratio	

3.0 Skidtube Geometry

Figure 2 in Reference 1 illustrates the geometry involved in the Dart skidtube design. These dimensions have been extracted from dwgs D2600 and D2792. The D2792 web extrusion is machined in sections to reduce weight. The D206-642-511/-512/-513/-514 skidtubes have the same geometry, however the -513/-514 has additional holes needed for the OEM floats.

$c = 1.575 \cdot \text{in}$	Skidtube outer radius
$tf = 0.095 \cdot \text{in}$	Flange thickness on skidtube
$df = 0.188 \cdot \text{in}$	Diameter of float bag attachment holes
$dsad = 76.28 \cdot \text{in}$	Distance between saddles
$Itube = 0.986 \cdot \text{in}^4$	Inertia of D2600-1 tube extrusion
$Iweb1 = 1.294 \cdot \text{in}^4$ <i>was 1.333</i>	Inertia of D2792 web extrusion (max machining)
$Iweb2 = 2.067 \cdot \text{in}^4$	Inertia of D2792 web extrusion (unmachined)
$Idblr1 = 0.016 \cdot \text{in}^4$	Inertia of D3283-1 doubler (on aft bend of web)
$Id1 = Itube + Iweb1$ $Id1 = 2.28 \cdot \text{in}^4$	Dart 206L/407 skidtube inertia (fwd of aft saddle, between saddles, the web is machined web)
$Id2 = Itube + Iweb2 + 2 \cdot Idblr1$	
$Id2 = 3.085 \cdot \text{in}^4$	Dart 206L/407 skidtube inertia at aft saddle (web is unmachined)

CP 10.04.20

6.0 Skidtube Substantiation

6.1 General

From tests conducted by Dart on similar skid tubes (Reference 1, Page 4A, 4B, 4C), the round I-beam section has a shape factor of 1.22. Calculation shows that the Dart skid tube without the I-beam (Reference 1, Page 4D) has a shape factor of 1.27 and that the skid tube with the D2792 web has a shape factor of 1.32 (Reference 1, Pages 4E & 4F). For simplicity a shape factor of 1.22 will be conservatively used for all sections. The data presented in TR-P305-1 has been accepted by the FAA during the OH-58 skid tube approval (SR00912SE). Therefore the modulus of rupture can be extended according to C3.14 of Bruhn. The table C3.2 of Bruhn gives values for the Plastic Bending Factor, "fo", for varying "Fty" and "Ftu". The value of "fo" is adjusted here for "Fty" and "Ftu" for extruded 6061-T6 (QQ-A-200/8).

$K = 1.22$ Shape factor

A safety factor of 1.5 per FAR 27.303 will be applied for design to ultimate loads.

$sf = 1.5$ Safety factor

A fitting factor of 1.15 per FAR 27.625 will be applied where fasteners are used to transfer loads.

$ff = 1.15$ Fitting factor

6.2 Bending at Forward Saddle (section A-A)

As shown in section 3.4 of this document, the FAR 27.501f1 loading causes a larger bending moment at the forward saddle than the forward float load. If the skid tube can withstand the loading of FAR 27.501f1 then it will also withstand forward float bag loading.

$Mf1 = 42238 \cdot \text{lb} \cdot \text{in}$

Bending moment at fwd saddle from FAR 27.501f1

Yield Bending (compression)

$$Sbc1 = \frac{Mf1 \cdot c}{Id1}$$

$$Sbc1 = 29177 \cdot \text{lb} \cdot \text{in}^{-2}$$

Yield tensile stress at forward saddle from bending

$$Fcy1 = 34000 \cdot \text{lb} \cdot \text{in}^{-2}$$

6061-T6 Yield compressive strength

$$MSt1 = \frac{Fcy1}{Sbc1} - 1$$

$$MSt1 = 0.17$$

Margin of Safety

Ultimate Bending

$$Sbu1 = \frac{Mf1 \cdot sf \cdot c}{Id1}$$

$$Sbu1 = 43766 \cdot \text{lb} \cdot \text{in}^{-2}$$

Ultimate tensile stress at forward saddle from bending

$$Ftu1 = 40000 \cdot \text{lb} \cdot \text{in}^{-2}$$

6061-T6 Ultimate tensile strength

$$fo = Ftu1 \cdot \frac{40500}{42000}$$

$$fo = 38571 \cdot \text{lb} \cdot \text{in}^{-2}$$

Adjusted plastic bending factor (Bruhn section C3.14)

$$Fb = Ftu1 + fo \cdot (K - 1)$$

$$Fb = 48486 \cdot \text{lb} \cdot \text{in}^{-2}$$

Stress to rupture skid tube (Bruhn section C3.14)

$$MSu1 = \frac{Fb}{Sbu1} - 1$$

$$MSu1 = 0.11$$

Margin of Safety

CP
10.04.20